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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/828,441

04/20/2004

Li-Qun Xia

AMAT/6392.C1/DSM/LOW
K/JW

4006

7590

01/04/2005

Applied Materials
Patent Counsel - Legal Affairs Department
P.O. Box 450A
Santa Clara, CA 95052

EXAMINER

NGUYEN, HA T

ART UNIT	PAPER NUMBER
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2812

DATE MAILED: 01/04/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/828,441

Applicant(s)

XIA ET AL.

Examiner

Ha T. Nguyen

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 26-45 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 26-45 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 April 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>8-9-4&7-6-4</u> | 6) <input type="checkbox"/> Other: ____ |

DETAILED ACTION

1. The Pre-liminary amendment filed 5-3-4 has been entered.

Claim Rejections - 35 USC 103

- 1a. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103 and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

2. Claims 26-27, 29-30, 33-38, 40-41, and 44-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chooi et al. (USPN, hereinafter "Chooi").

Referring to Figs. 1-3 and related text, Chooi discloses [Re claims 26-27] a method for depositing a barrier layer on a substrate, comprising: introducing a processing gas comprising an organosilicon compound into a processing chamber, wherein the organosilicon compound consists essentially of silicon, carbon, and hydrogen, and has a carbon atom to silicon atom ratio of 6:1 or greater; and reacting the organosilicon compound to form a silicon carbide layer 16 having a dielectric constant in the range of 3-6.5; wherein the substrate comprises metal features 14 and the barrier layer is formed thereon; [Re claims 35-38] a method for processing a substrate having metal 14 therein, comprising: formed depositing a barrier layer 16 on the substrate on the metal features by introducing a processing gas comprising an organosilicon compound into a

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processing chamber, wherein the organosilicon compound consists essentially of silicon, carbon, and hydrogen, and has a carbon atom to silicon atom ratio of about 6:1 or greater and the barrier layer has a dielectric constant in the range of 3-6.5; and depositing a first dielectric layer adjacent the barrier layer, wherein the first dielectric layer 18 comprises silicon, oxygen, and carbon and has a dielectric constant of about 3 or less ; depositing a silicon carbide etch stop 20 on the first dielectric layer; depositing a second dielectric layer 22 on the silicon carbide etch stop (see col. 3, line 45-col. 5, line 10). But it fails to disclose expressly the claimed ranges. However, in the case where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists (See MPEP 2144.05).

[Re claims 29 and 40] Chooi also discloses wherein the processing gas further comprises a carrier gas selected from the group consisting of argon (Ar), helium (He), neon (Ne), xenon (Xe), nitrogen (N₂), and combinations thereof (see col. 4, lines 5-19);

[Re claims 30 and 41] wherein the processing gas further includes a dopant selected from the group consisting of an oxygen-containing compound, a nitrogen-containing compound, a boron-containing compound, a phosphorus-containing compound, and combinations thereof (see col. 3, lines 21-32);

[Re claims 33 and 44] wherein organosilicon compound has a carbon atom to silicon atom ratio of 8:1 (see col. 3, lines 46-49);

[Re claims 34 and 45] wherein organosilicon compound has a carbon atom to silicon atom ratio of 9:1(see col. 3, lines 56-58);.

Therefore, it would have been obvious to use Chooi’ s teaching to obtain the invention as specified in claims 26-27, 29-30, 33-38, 40-41, and 44-45.

3. Claims 28 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chooi, as applied above, in view of Yang et al. (USPN 6365527, hereinafter “Yang”).

Chooi discloses substantially the limitations of claims 28 and 39, as shown above.

But it fails to disclose expressly wherein the barrier layer is exposed to a plasma treatment process.

However, the missing limitation is well known in the art because Yang discloses this feature (See Fig. 1).

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A person of ordinary skill is motivated to modify Chooi with Yang to obtain a reduction of residual oxygen in the SiC layer .

Therefore, it would have been obvious to combine Chooi with Yang to obtain the invention as specified in claims 28 and 39.

4. Claims 31-32 and 42-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chooi, as applied above, in view of Olsen et al. (USPN 6528426, hereinafter "Olsen").

Chooi discloses substantially the limitations of claims 31-32 and 42-43, as shown above.

But it fails to disclose expressly [Re claims 31 and 42] wherein the barrier layer is deposited under plasma conditions at a chamber pressure of less than 500 Torr; and [Re claims 32 and 43] wherein the barrier layer is deposited at a temperature of less than 500C.

However, the missing limitations are well known in the art because Olsen discloses these features (See col. 3, lines 49-57).

A person of ordinary skill is motivated to modify Chooi with Olsen to obtain SiC at suitable temperature and pressure.

Therefore, it would have been obvious to combine Chooi with Olsen to obtain the invention as specified in claims 31-32 and 42-43.

Conclusion

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ha T. Nguyen whose telephone number is (571) 272-1678. The examiner can normally be reached on Monday-Friday from 8:30AM to 6:00PM, except the first Friday of each bi-week. The telephone number for Wednesday is (703) 560-0528.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John F. Niebling, can be reached on (571) 272-1679. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

6. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR

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system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Ha Nguyen

Primary Examiner

12- 23 - 04